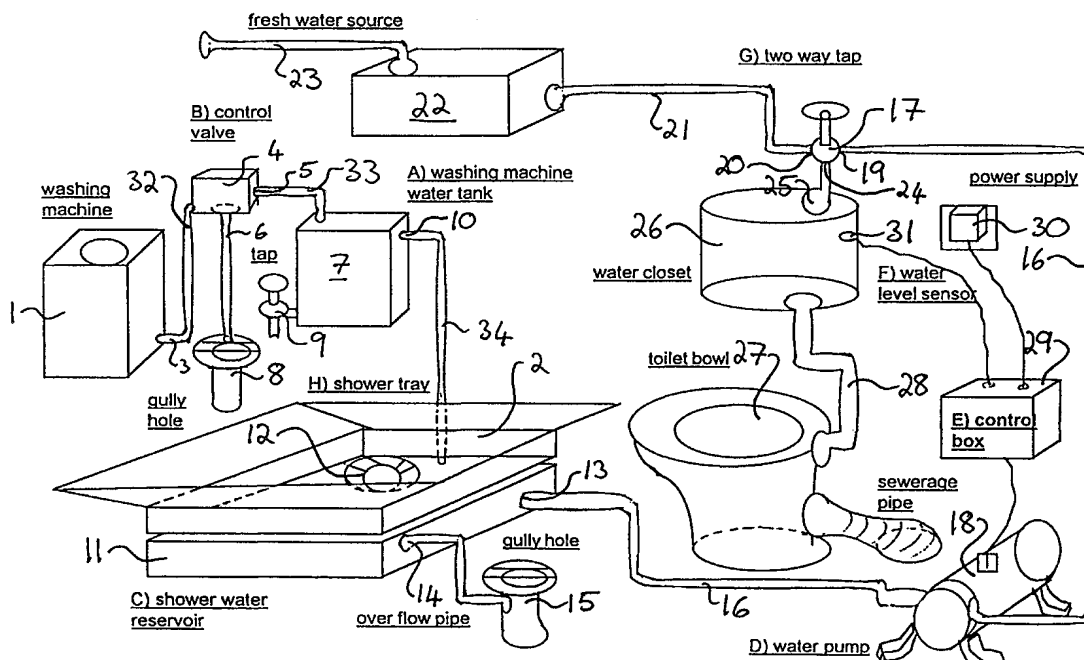




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(54) Title:** A SYSTEM FOR REUSING WASTE WATER**(57) Abstract**

A system for reusing waste water includes a first conduit (32, 33, 34) which couples a waste outlet (3) from a water consuming appliance (1) to an inlet on a used water tank (11). A second conduit (16) is coupled from an outlet (13) on the used water tank (11) to an inlet on a cistern (26) for holding water for flushing a toilet (27).

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## A SYSTEM FOR REUSING WASTE WATER

The invention relates to a system for reusing waste water.

A number of systems and devices have already been proposed for reducing water consumption. For example, systems are available which reduce the amount of water used to flush toilets and which regulate the automatic flushing of toilets and urinals.

All these conventional systems tend to minimise water consumption by reducing the amount of water which is used to flush the toilets or urinals. This can have the disadvantage that the toilet may not be flushed properly.

In accordance with the present invention, a system for reusing waste water comprises a first conduit coupling a waste outlet from a water consuming appliance to an inlet on a used water tank; and a second conduit coupled from an outlet on the used water tank to an inlet on a cistern for holding water for flushing a toilet.

An advantage of the invention is that the system permits waste water from a water consuming appliance to be reused as water for flushing a toilet and therefore, reduces the amount of fresh water that is used for flushing a toilet.

Preferably, the system also includes a pump to pump water along the second conduit from the used water tank to the cistern and typically, the pump may be controlled by a control box which receives an input from a water level sensor in the cistern.

Typically, the system further comprises a valve mechanism comprising a first inlet, a second inlet and an outlet; the first inlet being coupled to the second conduit, the second inlet being coupled to an unused water source, and the outlet being coupled to the inlet of the cistern, and the valve mechanism being switchable from the first inlet to the second inlet in the absence of a supply of water from the second conduit.

Typically, the valve mechanism is switchable between the first inlet and the second inlet by the control box on detection of the absence of a water supply from the used water tank by a water sensor coupled to the control box. Alternatively, the valve mechanism may be manually actuable.

The water consuming appliance may be a washing machine, a shower or a bath. Where the water consuming appliance is a shower or a bath, the used water tank may be located beneath the shower tray or the bath, and the waste water outlet from the shower tray or the bath may include a filter device to filter solid material from the water

before it enters the used water tank.

Preferably, the used water tank may include an overflow pipe connected to a drainage or sewerage system such that when the used water tank is full, excess water is passed by the overflow into the drainage or sewage system. In addition, the used water tank may include another outlet, such as a tap, to permit used water to be taken from the tank into a container, such as a bucket.

Preferably, where the water consuming appliance is a washing machine, the system further comprises another valve mechanism having an inlet and first and second outlets, the inlet being coupled to the waste water outlet of the washing machine, the first outlet being coupled to the used water tank and the second outlet being coupled to a drainage or sewerage system. Typically, the other valve mechanism diverts used water from the first cycle of the washing machine to the second outlet and directs used water from subsequent cycles of the washing machine to the first outlet and the used water tank.

Typically, the system may include a separate used water tank for each water consuming appliance and the used water tanks may be linked together, typically in serial, by conduits to the first valve mechanism.

An example of a system for reusing waste water in accordance with the invention will now be described with reference to the accompanying drawing, in which:-

Figure 1 shows a system for reusing waste water.

Figure 1 shows two water consuming appliances: a washing machine 1; and a shower tray 2 which forms part of a shower. An outlet 3 from the washing machine 1 is connected to a water pipe 32 which is connected to an inlet of a control valve 4 which has two outlets 5, 6. The outlet 5 is connected to a water pipe 33 which connects the control valve 4 to a used water tank 7 and the outlet 6 is coupled to a drain 8.

The used water tank 7 includes a manually operated tap 9 which permits water to be drawn from the tank 7, for example, into a container such as a bucket. The tank 7 also has an outlet 10 which is connected by a water pipe 34 to a second used water tank 11 located below the shower tray 2. The shower tray 2 has a waste water outlet 12 which is connected to the second used water tank 11 and permits water to flow from the shower tray 2 into the used water tank 11.

The used water tank 11 has an outlet 13 and an overflow 14 which is connected to a drain 15. The outlet 13 is connected by a water pipe 16 to a two way valve 17 via a

water pump 18. The water pipe 16 is coupled to a first inlet 19 of the valve 17 and a second inlet 20 is coupled by a water pipe 21 to a cold water tank 22 which is filled by a water pipe 23 connected to a fresh (or unused) water source. The valve 17 also has an outlet 24 which is coupled by a water pipe 25 into a cistern 26 which is used to store water for flushing a toilet 27. The water for flushing the toilet 27 passes from the cistern 26 to the toilet 27 via a conduit 28.

A control box 29 is powered by a mains power supply 30 and is connected to a water level sensor 31 in the cistern 26, and to the water pump 18.

The valve 17 may be manually operable to connect the first inlet 19 or the second inlet 20 to the outlet 24.

Alternatively, the valve 17 may be operable automatically under control of the control box 29. For example, the valve 17 may be an electromechanical valve which is controlled by the control box 29 and the control box 29 is coupled to the pump to detect whether the pump is pumping water when it is operated. If the control box 29 detects that there is no water to be pumped through the pipe 16 when the water pump 18 is operating, then the control box 29 switches off the water pump 18 and switches the valve 17 so that the second inlet 20 is coupled to the outlet 24.

In use, during the washing cycle of the washing machine 1,

waste water flows from the outlet 3 of the washing machine 1 to the control valve 4 through the conduit 32. If the water from the washing machine is from the first portion of the washing cycle, then the control valve 4 is operated to discharge the used water through the outlet 6 to the drain 8. However, for a subsequent portions of the cycle, when the water exiting the outlet 3 is cleaner, the control valve 4 switches to pass the water to the outlet 5 and into the used water tank 7 through the pipe 33.

Water may then be drawn from the used water tank 7 by means of the tap 9 into to a container, such as a bucket.

Alternatively, the water from the water tank 7 is passed out by the pipe 34 to the used water tank 11. The used water tank 11 collects used water from the washing machine 1 via the tank 7 and from the shower tray 2 via the drain 12. Used water is then stored in the used water tank 11 and any excess water is discharged from the tank 11 through the overflow outlet 14 and into the drain 15.

When the toilet 27 is flushed, water from the cistern 26 passes through the pipe 28 to the toilet 27 and the cistern 26 empties of water. The control box 29 detects a drop in the water level in the cistern 26 by means of the water level sensor 31 and switches on the water pump 18 to pump water from the used water tank 11 through the pipe 16 to the valve 17. If the control box 29 detects water being pumped by the pump 18, the valve 17 is actuated such that

the first inlet 19 is switched to the outlet 25. Hence, water from the pipe 16 passes through the valve 17 out of the outlet 24 and into the pipe 25 to fill the cistern 26. When the cistern 26 has sufficient water in it, the control box 29 detects this via the water level sensor 31 and switches off the pump 18.

If the control box 29 detects that the pump is not pumping water when it is switched on, this indicates that there is no water in the tank 11 and the control box 29 switches off the pump 18 and switches the valve 17 so that the second inlet 20 is connected to the outlet 24. Hence, water from the cold water tank 22 passes through the pipe 21, the valve 17 and pipe 25 into the cistern 26 to fill the cistern 26.

An advantage of the invention is that it permits waste water to be used to fill the cistern 26 and flush the toilet 27.

As an alternative to having the valve mechanism 17, it is possible that the pipe 21 and the pipe 16 may discharge water directly into the cistern 26. In such a mechanism, the pipe 21 would have a valve operated by conventional float type valve in the cistern 26 and when toilet 27 is flushed, a mixture of waste water from the tank 11 and clean water from the cold water tank 22 would fill the cistern 26. In this alternative example, preferably, the

amount of water filling the cistern 26 from the pipe 16 would be greater than the amount of water filling the cistern 26 from the pipe 21.

CLAIMS

1. A system for reusing waste water comprising a first conduit coupling a waste outlet from a water consuming appliance to an inlet on a used water tank; and a second conduit coupled from an outlet on the used water tank to an inlet on a cistern for holding water for flushing a toilet.
2. A system according to claim 1, further comprising a pump to pump water along the second conduit from the used water tank to the cistern.
3. A system according to claim 2, further comprising a water level sensor in the cistern and a control device coupled to the water level sensor and to the pump, the control device controlling the pump in response to signals received from the water level sensor.
4. A system according to any of the preceding claims, further comprising a valve mechanism comprising a first inlet, a second inlet and an outlet; the first inlet being coupled to the second conduit, the second inlet being coupled to an unused water source, and the outlet being coupled to the inlet of the cistern; and the valve mechanism being switchable from the first inlet to the second inlet in the absence of a supply of water from the second conduit.

5. A system according to claim 4 when dependent on claim 3, wherein the control device is coupled to the valve mechanism and switches the valve mechanism in response to a water detection signal received from the pump.

6. A system according to any of the preceding claims, wherein the water consuming appliance is a washing machine, shower or a bath.

7. A system according to any of the preceding claims, wherein the system includes a number of water consuming appliances coupled by conduits to the used water tank.

8. A system according to claim 7, further comprising a number of used water tanks interconnected by conduits to each other and to the cistern.

9. A system according to claim 8, wherein the used water tanks are connected by conduits in serial to each other and to the cistern.

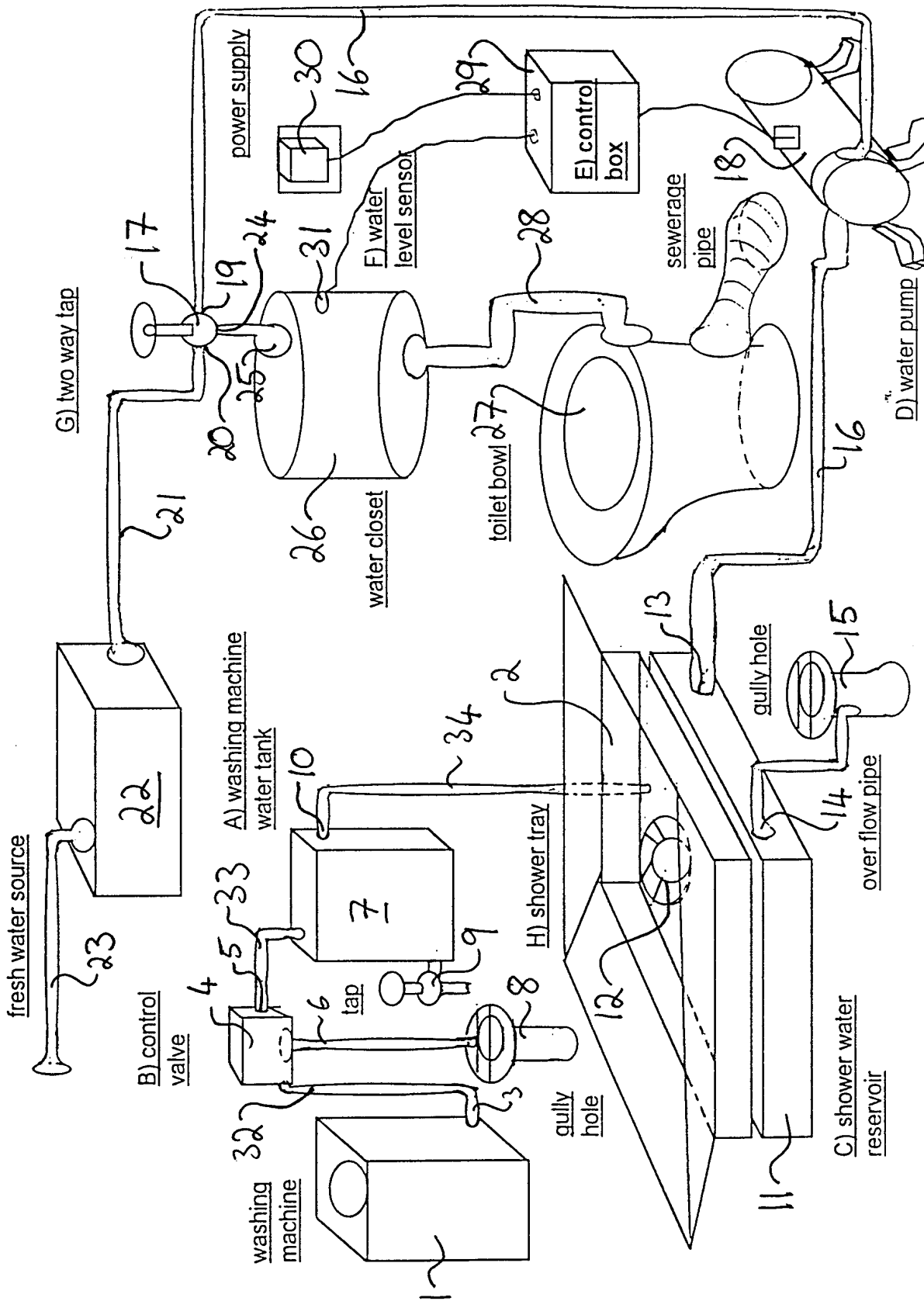


Figure 1

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SG 99/00033

## A. CLASSIFICATION OF SUBJECT MATTER

IPC<sup>6</sup>: E 03 C 1/122

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC<sup>6</sup>: E 03 C; E 03 D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 39 32 022 A1 (GREDIGK), 22 November 1990 (22.11.90), totality.	1-6
X	DE 42 28 804 A1 (KRAUSS), 03 March 1994 (03.03.94), fig.1.	1,2,7
X	WO 94/05 866 A1 (HYDROSAVE RECYCLING SYSTEMS PTY LTD.), 17 March 1994 (17.03.94).	1,2,6,7
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

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„&“ document member of the same patent family

Date of the actual completion of the international search

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01 September 1999 (01.09.99)

Name and mailing address of the ISA/AT

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SG 99/00033

In the DE 39 32 022 document a system for reusing waste water is disclosed, comprising all the features defined in claims 1-6:

Through a conduit waste water is lead from a bath or washing machine to a used water tank. From there, the waste water is delivered by a pump to the cistern of a WC. The pump is actuated by a control device, which also supervises a valve connected with the fresh water system and the waste water in the used water tank in case to replenish water in the cistern in response to a water detection device.

The further documents cited in the search report show systems for reusing waste water including a number of water consuming appliances coupled over conduits to the used water tank, as is drafted in claims 1,2 and especially 7, but also in claim 6.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/SG 99/00033

In Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche		Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
DE A1	3932022	22-11-1990	keine - none - rien	
DE A1	4228804	03-03-1994	DE U1 9218367	24-03-1994
WO A1	9405866	17-03-1994	keine - none - rien	

**PUB-NO:** WO009954559A1  
**DOCUMENT-IDENTIFIER:** WO 9954559 A1  
**TITLE:** A SYSTEM FOR REUSING WASTE WATER  
**PUBN-DATE:** October 28, 1999

**INVENTOR-INFORMATION:**

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**INT-CL (IPC):** E03C001/122

**EUR-CL (EPC):** E03B001/04

**ABSTRACT:**

**CHG DATE=19991202 STATUS=O>A system for reusing waste water includes a first conduit (32, 33, 34) which couples a waste outlet (3) from a water**

**consuming appliance (1) to an inlet on a used water tank (11). A second conduit (16) is coupled from an outlet (13) on the used water tank (11) to an inlet on a cistern (26) for holding water for flushing a toilet (27).**